

## **ELECTRONIC ARTICLE SURVEILLANCE (EAS) TAG COMPATIBLE WITH MECHANICAL AND MAGNETIC UNLOCKING DETACHERS**

### **FIELD OF THE INVENTION**

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The present invention relates generally to apparatuses and method for providing a security tag for use in an electronic article surveillance (EAS) system. More particularly, this invention is related to a security tag for use in an EAS system wherein the security tag is compatible and can be unlocked by either a magnetic or mechanical tag-detaching machine.

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### **BACKGROUND OF THE INVENTION**

Conventional security tags for affixing to an article to operate with the electronic article surveillance (EAS) systems for inventory control or anti-theft operations generally have two types of attaching mechanisms. The first type of attaching mechanism is releasable by a finger key to mechanically probe and push an unlocking mechanism to detach the tag. The second type of attaching mechanism is releasable by applying a magnetic detacher to magnetically pull up a metallic spring and release a locking pin. These two types of tags are not mutually compatible and every tag can be operable only with one type of detaching machines. The applicability of either type of security tags is therefore limited only to only one system thus limiting the scopes of the marketability of the tags and that often causes inconvenience and cost increase due to this limitation.

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Another disadvantage often associated with a mechanical type of tags is the grooves employed for engaging and locking the pin for securely locking the tag. During the unlocking process, in pulling out the pin, the grooves on the pin with sharp edges, as that required for engaging and securely locking the pin, may pull the threads of the more delicate fabric materials or materials wrapped around the pin thus causing damages to the attached articles. Even with special cares, the damages may still occur and that make the application of this types of tags less than desirable on

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more delicate fabrics even when these clothes made with delicate fabrics are often more expensive and must be more closely monitored.

5 For the purpose of inventory control and anti-theft by unauthorized removal of an article from a control area, electronic article surveillance systems are established with system transmitter and system receiver to establish a surveillance zone. An EAS tag is attached to each protected article. The tag includes a marker or a sensor to interact with a signal transmitted by the system transmitter to the surveillance zone. The  
10 interaction generates another signal received by the system receiver. Thus when a protected article is removed to a surveillance zone, a signal is received by the system receiver to indicate an EAS tagged article is removed to the surveillance zone without proper authorization. In order to provide reusable tags, the EAS tags typically include releasable  
15 attachment mechanism to attach the tag to the protected article and then released by authorized persons when the protected article is authorized to move to a surveillance zone. By allowing an authorized person to release the tag from an attached article by the use of special tools or detachers, the alarm signal of article removal will be received only when the removal is  
20 unauthorized.

Many prior art patents have disclosed different types of attaching and detaching mechanisms to implement on an EAS tag. These patents include US Patents 3914829, 3942829, 3947930, 4311992, 5031756, and  
25 5426419 are herein incorporated by reference in this Application. As the tags disclosed in these Patents employ the mechanical detachers, the tags are not compatible and not operable with a magnetic detacher.

However, as discussed above, the detaching mechanisms for  
30 conventional attachment mechanisms are limited by their applications only to either the mechanical or magnetic types of detachers. For these reasons, a need still exists in the art of design and manufacturing of the EAS tag attachment-detachment mechanisms to provide new and improved designs and configurations to enable a person of ordinary skill in the art to  
35 overcome such limitations.

### SUMMARY OF THE PRESENT INVENTION

5 It is therefore an object of the present invention to provide a new and improved attaching-detaching mechanism that would be compatible and operable by either a mechanical or magnetic detacher. The EAS tags as disclosed in this invention can be employed with surveillance systems provided with either types of detaching machines or tools such that the above-mentioned limitations and difficulties can be resolved.

10 Specifically, it is an object of this invention to provide a attaching-detaching mechanism that has a pin that is inserted and locked by a spring-pressed balls. The spring can be released by using either a finger-key to probe and pushing a spring-releasing mechanism or by applying a magnetic force to pull the metallic spring away from the ball-pressing  
15 position to release the balls to detach the pin from the spring-pressed ball-lock. By the use of the pressed balls as a locking mechanism, the pin used for attaching and locking is made with smooth surface without requiring a groove such that the disadvantage associated with grooved pin is eliminated.

20 Furthermore, it is the object of this invention to provide a attaching-detaching mechanism for an EAS tag that not only can be operated with either a mechanical or a magnetic detacher, but also the strength of attachment can be conveniently adjusted by simply changing  
25 to a spring of different pressing force. The applications of an EAS tag as disclosed by this invention thus can provide broader scopes and more flexibilities for protecting different types of tagged articles monitored by the electronic surveillance systems.

30 Briefly, in a preferred embodiment, the present invention discloses an EAS tag that includes an attaching-detaching mechanism for attaching to an article wherein the attaching-detaching mechanism can be released by either applying a mechanical pushing means or by a magnetic means to detach the attaching-detaching mechanism from an attaché article. In a  
35 preferred embodiment, the attaching-detaching mechanism includes a

locking mechanism for locking to an attachment pin. The locking mechanism is pressed by a pressing spring for tightening the locking mechanism to lock the attachment pin. The pressing spring is releasable by a mechanical pushing probe or a magnetic pulling force to release the locking mechanism to detach the attachment pin from the locking mechanism.

In a preferred embodiment, this invention further discloses a method for attaching/detaching an EAS tag. The method includes a step of providing an attaching-detaching mechanism releasable by either a mechanical pushing means or by magnetic releasing means. In a preferred embodiment, the step of providing said attaching-detaching mechanism further includes a step of locking an attachment pin and releasing and unlocking said attachment pin by applying either the mechanical pushing means or said magnetic releasing means.

These and other objects and advantages of the present invention will no doubt become obvious to those of ordinary skill in the art after having read the following detailed description of the preferred embodiment, which is illustrated in the various drawing figures.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a disassembled security tag for releasably attaching to a tagged article implemented with an attaching-detaching mechanism of this invention.

Fig. 2 is a top perspective view of a bottom cover of the security tag of Fig. 1 for this invention.

Fig. 3 is a perspective view for showing a movement of an outer holding cup when an unlocking magnet is applied to release the locking pin from the security tag.

## DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is a perspective view of a disassembled security tag 100 for operation with a detachable pin 150 supported on a nail-head 155 for  
5 attaching to a protected article that includes an attaching-detaching mechanism of this invention. The pin 150 is inserted through a hole 152 as that shown in Fig. 2 into an inner cup 145. The inner cup 145 is surrounded by an outer cylinder 140 which is then tightly engaged by a rotating-releasing cylinder 130 that has an engagement nose 135 sticks out  
10 from the rotating-releasing cylinder 130. The attaching-detaching mechanism further includes a ball holder 125 having three holes to admit three balls 120 into the inner space of the ball holder 125. A spring 115 is configured to engage the ball holder 125. As the top cover 105 push on the spring 115, the spring 115 presses down the ball holder 125 together  
15 with three balls 120 and force the ball holder 125 to reach to the lower part of the inner cup 145. As can be seen from Fig. 1, the inner cup 145 has a gradually reduced volume at the bottom and an expanded space on the top portion. As the ball holder 125 is pushed down, the three balls 120 are squeezed by the inner cup 145 to tightly press onto the pin 150 thus  
20 prevent the pin from being removed.

A special mechanical tool, e.g., a finger key probe 160 may be inserted through an opening 101 to push the releasing nose 135 to release the pin 150 from the three balls 120. When the releasing nose 130 is  
25 pushed, the rotating-releasing cylinder 135 begins to rotate and the releasing nose 130 is engaged to a sloped elevation pushing-base 158 supported on the bottom cover 110 that pushes the rotating-releasing cylinder 135 to a higher position further away from the bottom cover 110. The rotating-releasing cylinder 125 also push the ball-holder 125 to raise to  
30 a higher position while the inner cup 145 is held down by the outer cylinder 140 to remain at the same position. As the ball holder 125 reaches a higher position within the inner cup 145, the large space at the top portion of the inner cup 145 now allows more space surrounding the balls 120. Without the pressing force from the side wall of the inner cup 145 the  
35 balls begin to fall away from the pin 150 thus allows the pin to be released.

Fig. 2 is a top perspective view of the bottom cover 110 that include a hole 152 to allow the pin 150 to enter into the inner holding cup 145 such that the pin 150 is held by three balls as these balls are squeezed by the narrower surround side wall of the inner holding cup 145. Fig. 3 shows the unlocking mechanism by applying a magnetic unlocking means, e.g. a magnet 170 that is placed on top of the top cover 105. The magnet 170 asserting a pulling force on the spring and the ball holder 125 to move upward while the outer cup 140 engaged the inner cup 145 to keep the inner cup 145 at a fixed position. As the ball holder 125 is pulled up to an upper portion of the inner holding cup 145, the three balls have open space to move outward from the ball holder 124 thus fall away from the pin 150. The pin 150 is released and the security tag can be unlocked by pulling the pin out from the security tag 100.

According to Figs. 1-3 and above descriptions, this invention discloses a security tag that includes a tag body and an attaching means for attaching the tag body to an article. The security tag further includes a locking means for releasably preventing the attaching means from being removed from the article wherein the locking means is provided for mechanically or magnetically released the attaching means for detaching the tag body from the article. In a preferred embodiment, the locking means further includes a plurality of balls for tightly holding to the attaching means for releasably preventing the attaching means from being removed from the article. In a preferred embodiment, the locking means further includes a mechanical unlocking means for applying a mechanical force to release the balls from the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the locking means further includes a magnetic unlocking means for applying a mechanical force to release the balls from the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the locking means further includes a ball tightening and loosening means for tightening the balls to the attaching means. And, the locking means further includes a mechanical unlocking means for applying a mechanical force to the ball tightening and loosening means for loosening the balls

from the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the locking means further includes a magnetic unlocking means for applying a mechanical force to release the balls from the attaching means whereby

5 the attaching means may be released and detached from the tag body. In a preferred embodiment, the ball tightening and loosening means further includes a ball surrounding surface defining a restrict space and an expanded space for forcing the balls into the restrict space for tightening the balls to the attaching means. And, the mechanical unlocking means

10 further applying a mechanical force to move the balls to the expanded space of the ball tightening and loosening means for loosening the balls from the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the magnetic unlocking means further applying a magnetic force to move the

15 balls to the expanded space of the ball tightening and loosening means for loosening the balls from the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the ball tightening and loosening means further includes ball holding cup having a plurality of holes for each of the balls

20 surrounded by the ball surrounding surface wherein the locking means pressing the ball holding cup for forcing the balls into the restrict space for tightening the balls to the attaching means. And, the mechanical unlocking means further applying a mechanical force to move the ball holding cup together with the balls to the expanded space of the ball

25 tightening and loosening means for loosening the balls from the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the magnetic unlocking means further applying a magnetic force to move the ball holding cup together with the balls to the expanded space of the ball tightening and loosening

30 means for loosening the balls from the attaching means whereby the attaching means may be released and detached from the tag body. In a pre In a preferred embodiment, the security tag further includes a mechanical probe finger for pushing and applying a mechanical force onto the locking means to release the attaching means whereby the attaching

35 means may be released and detached from the tag body. In another

preferred embodiment, the security tag further includes a magnet for applying a magnetic force onto the locking means to release the attaching means whereby the attaching means may be released and detached from the tag body.

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In essence, this invention further discloses a security tag that includes an attaching means for attaching the tag to a protected article. The security tag further includes a locking means for locking the attaching means for releasably preventing the attaching means from being removed from the protected article wherein the locking means is provided to be unlocked for releasing the attaching means from the tag by one of at two different kinds of unlocking means. In a preferred embodiment, the locking means is provided to be unlocked by a mechanical unlocking and a magnetic unlocking means. In a preferred embodiment, the security tag includes a mechanical probe finger for pushing and applying a mechanical force onto the locking means to release the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the security tag includes a magnet for applying a magnetic force onto the locking means to release the attaching means whereby the attaching means may be released and detached from the tag body. In a preferred embodiment, the locking means further includes a plurality of balls for tightly holding to the attaching means for releasably preventing the attaching means from being removed from the article. In another preferred embodiment, the locking means further includes a mechanical unlocking means for applying a mechanical force to release the balls from the attaching means whereby the attaching means may be released and detached from the security tag. In another preferred embodiment, the locking means further includes a magnetic unlocking means for applying a mechanical force to release the balls from the attaching means whereby the attaching means may be released and detached from the security tag.

According to the disclosure made in this invention, the present invention further discloses a method for protecting an article by using an attaching means for attaching a security tag to a protected article. The

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method further includes a step of preventing the attaching means from being removed from the protected article by releaseably locking the attaching means and for unlocking and releasing the attaching means from the tag by either one of at two different kinds of unlocking means.

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Although the present invention has been described in terms of the presently preferred embodiment, it is to be understood that such disclosure is not to be interpreted as limiting. Various alternations and modifications will no doubt become apparent to those skilled in the art after reading the above disclosure. Accordingly, it is intended that the appended claims be interpreted as covering all alternations and modifications as fall within the true spirit and scope of the invention.

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